REMARKS/ARGUMENTS

Reconsideration of the application is requested.

Claims 1-5 and 8-30 remain in the application. Claims 1 and 20 have been amended. Claims 6-7 have been cancelled.

In item 2 on pages 2-7 of the above-mentioned Office action, claims 1-5, 8-12, 15-18, 20, 23-26, and 28-30 have been rejected as being unpatentable over Chuang et al. (US Pat. No. 6,137,570) in view of the applicant's admitted prior art under 35 U.S.C. § 103(a).

In item 3 on pages 7-9 of the above-mentioned Office action, claims 6-7, 13-14, 19, 21, and 31 have been rejected as being unpatentable over Chuang et al. in view of the applicant's admitted prior art and further in view of Kallioniemi et al. ("Optical scatterometry of subwavelength diffraction gratings: neural-network approach," Applied Optics, vol. 37, No. 25, September 1, 1998, pp. 5830-5835) under 35 U.S.C. § 103(a).

In item 4 on pages 10-11 of the above-mentioned Office action, claims 22 and 27 have been rejected as being unpatentable over Chuang et al. in view of the applicant's admitted prior art

and further in view of McNeil et al. (US Pat. No. 5,703,692) under 35 U.S.C. § 103(a).

The rejections have been noted and claims 1 and 20 have been amended in an effort to even more clearly define the invention of the instant application. Support for the changes is found in original claims 6-7 as well as on page 42, lines 14-16 of the specification.

Before discussing the prior art in detail, it is believed that a brief review of the invention as claimed, would be helpful.

Claim 1 calls for, inter alia:

> if a similarity between the reference signatures and measured signature has been found in the comparison step, then performing the step of:
>
> > classifying parameters of the test specimen surface based on the comparison results;
>
> or otherwise performing the steps of:
>
> > measuring individual structures of the test specimen surface with a <u>high resolution measuring device for specifying a quality of the test specimen surface and for providing a further reference signature; and</u>
> >
> > <u>adjusting the weighting of at least one of the fuzzy logic and the neural network as a function of the further reference signature;</u>
> >
> > <u>classifying parameters of the test specimen surface based on the measurement of the individual structures</u>.

Claim 20 calls for, inter alia:

> a high-resolution measuring device for measuring individual structures of the test specimen surface for specifying a quality of the test specimen surface and for providing a further reference signature, the weighting of the at least one of the neural-network and the fuzzy logic being adjusted as a function of the further reference signature;
>
> said classification module classifying parameters of the test specimen surface based on the comparison results, if a similarity between the reference signatures and measured signature has been found in the comparison step, otherwise classifying parameters of the test specimen surface based on the measurement of the individual structures.

It is an object of the invention of the instant application to assess the quality of structured layers on a surface using diffraction measurement or scattered light measurement, commonly known as scatterometry. In a first step, a plurality of reference patterns are measured in order to provide reference signatures of structured surfaces. A specified quality of the reference signatures is used for training a neural-network or a fuzzy logic. Next, diffraction images or scattered light images provide a measured signature of a test specimen. The neural network or the fuzzy logic is now used to compare the measured signature with the reference signatures in order to provide a comparison result.

If the test specimen surface exhibits structures similar to one of the reference signatures, it is possible to classify

the parameters of the test specimen surface based on the comparison result performed by the neural-network or a fuzzy logic. If, however, the comparison fails, i.e. a comparison result cannot be provided, the individual structures of the test specimen surface are measured with a high-resolution measuring device, e. g. a scanning electron microscope.

Instead of performing the comparison, a result is provided by the measurement of the individual structures with the high-resolution measuring device. In the next step, this result is used to adjust a weighting of the fussy logic or the neural-network as a function of the measurement result.

According to the invention of the instant application, it is not necessary to reconstruct the individual structures of the test specimen by using a calculation from the circuit layout. In addition, it is not necessary that the neural-network or the fuzzy logic provide a quantitative characterization of the test specimen surface. The neural-network or the fuzzy logic is only used to decide which of the reference patterns fits best to the device under test. If, however, none of the reference patterns fits the test specimen surface, a conventional high-resolution apparatus is used to determine the parameters. The result of this step is in turn forwarded

to the neural-network or the fuzzy logic in order to learn the new signature.

Chuang et al. disclose a method and apparatus for using far field scattered and diffracted light in order to determine whether a collection of topological features on a surface conforms to an expected condition or quality. The determination is made by comparing the far field diffraction of a surface under consideration of a corresponding diffraction pattern, which is called base-line pattern. If the base-line diffraction pattern and the measured far field diffraction pattern vary by more than a prescribed amount, it is inferred that the surface features are defective.

Kallioniemi et al. disclose a method for performing an accurate quantitative characterization of the geometry of a different grating, which is deduced from diffraction-pattern data, by using a neural-network. With respect to page 5833 and further to Fig. 4, it is shown that the neural-network provides output values, which quantify the grating parameters that characterize the grating geometry.

According to the invention of the instant application, the neural-network or the fuzzy logic are used to characterize the measured structure with respect to reference patterns in order

to associate the parameters of the reference pattern, which fits best to the measured structure, to the measured structure itself. If there is no such reference pattern that fits to the measured structure, a further measurement with a conventional high-resolution apparatus, e.g. a scanning electron microscope, is performed. Then the leaning capacities of a neural-network or the fuzzy logic are used to provide this information for subsequent measurements.

This concept of the invention of the instant application, however, cannot be seen in Chuang et al. or Kallioniemi et al. Chuang et al. simply want to evaluate a non-random topological variation on the surface of a substrate using a rapid and non-destructive technique. As stated in column 2, lines 12-16, Chuang et al. want to avoid the use of a scanning electron microscope. The inventive concept of the invention of the instant application of using the scanning electron microscope in cases where the comparison fails is not shown in Chuang et al.

Kallioniemi et al. use a neural-network for an accurate quantitative characterization, but fail to show that the combination of a high-resolution apparatus with the learning capability of the neural network improves the quantity of a comparison step.

A person skilled in the art would not arrive at the invention of the instant application even if the references Chuang et al. and Kallioniemi et al. were combined. Both documents do not show the inventive concept the invention of the instant application of using a high-resolution apparatus when it is not possible to derive parameters from a comparison with the reference pattern. Advantageously, the invention of the instant application uses the leaning capability of the neural-network or fuzzy logic to store the newly gained data of the further reference pattern by adjusting a weighting of the neural-network or fuzzy logic.

It is accordingly believed to be clear that none of the references, whether taken alone or in any combination, either show or suggest the features of claims 1 and 20. Claims 1 and 20 are, therefore, believed to be patentable over the art and since all of the dependent claims are ultimately dependent on claims 1 or 20, they are believed to be patentable as well.

In view of the foregoing, reconsideration and allowance of claims 1-5 and 8-30 are solicited.

In the event the Examiner should still find any of the claims to be unpatentable, counsel would appreciate a telephone call so that, if possible, patentable language can be worked out.

If an extension of time for this paper is required, petition for extension is herewith made. Please charge any fees which might be due with respect to 37 CFR Sections 1.16 and 1.17 to the Deposit Account of Lerner and Greenberg, P.A., No. 12-1099.

Respectfully submitted,

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